Middle-level CTE Learning Experience Title: Birds in Our Backyard Educator: Tonya Lackey, Westport Central School District Length of Lesson: 11 days (40 minute periods) Grade Level: 7-8	CTE Area: Technology and Engineering Education CTE Theme: Problem Solving and Innovation CTE Content: Design Date Created: September 10, 2019

PLANNING	
Curriculum Goal	Students identify a problem that requires a designed solution such as a new product that can be made from recycled materials. Students develop a problem statement, constraints and parameters, and proposed solutions. Students develop a model or prototype for testing and optimization, record the process, and present results. Examples of design problems could include a structure, a household item, a planting container, or others.
Essential Question(s)	What do students need to understand about how to apply design processes to address human needs and wants? What knowledge and skills are necessary to demonstrate an introductory understanding of the application of problem-solving processes and the acquisition, evaluation, and application of the products of research for informed decision making?
National Standards	Common Career Technical Core Standards Career Ready Practices www.careertech.org/career-ready-practices 1. Act as a responsible and contributing citizen and employee 2. Apply appropriate and academic and technical skills 5. Consider environmental, social, and economic impacts of decisions 6. Demonstrate creativity and innovation 8. Utilize critical thinking to make sense of problems and persevere in solving them 11. Use technology to enhance productivity 12. Work productively in teams while using cultural global competence International Technology and Engineering Education Association Standards for Technological Literacy www.iteea.org/39197.aspx The Design World 8. Students will develop an understanding of the attributes of design. 9. Students will develop an understanding of engineering design. 10. Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem-solving.
NYS Standards	New York State Career Development and Occupational Studies (CDOS) Standards Intermediate Level http://www.p12.nysed.gov/cte/ Standard 1: Career Development

	Students will be knowledgeable about the world of work, explore career options, and relate personal skills, aptitudes, and abilities to future career decisions. Standard 2: Integrated Learning Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings. Standard 3a: Universal Foundation Skills Students will demonstrate mastery of the foundation skills and competencies essential for success in the workplace.
Learning Objectives	Problem Solving and Innovation 2. Design Process (Proactive) Students will a) Implement a formal design process to solve a given problem by a. Defining the problem being addressed b. Defining criteria that must be met through the finished design c. Defining constraints that must be adhered to d. Brainstorming and examining possible solutions e. Selecting the best solution for evaluation f. Developing and constructing a prototype or model of the selected design g. Testing and evaluating the prototype and model against the design criteria and constraints i. Evaluating their use of the design process and how it impacted their final solutions b) Demonstrate personal development of design skills through practice of these skills in a variety of classroom applications Design 1.The Attributes of Design Students will a) Define design as a creative planning process used to develop products and systems b) Elaborate on how every design has the potential to be improved c) Define criteria and constraints and how they are applied as design requirements 2. Engineering Design Students will a) Define the steps of an engineering design process and their sequence and illustrate how they can be repeated b) Collaborate with others through brainstorming as an open group problem-solving process c) Demonstrate how modeling, testing, evaluating, and modifying are applied toward developing practical design solutions

Vocabulary	Academic Presentation, Design Group, Communication, Design Thinking, Engineering Design Cycle	Content Ornithology, species, habitat, Engineering Design Process, tool safety, personal safety, statistics, tally chart, pie charts, bar chart, observe, graph, traits, features, adaptation, simple machines (lever), lift, drag, gravity, camouflage	
Materials and Resources	Access to tablets or iPads with the Sibley Birds of North America App installed (Day 1 - 2) Access to MS Excel, Google Sheets, or provide rulers, coloring utensils, chart paper, Post-its Notes (Day 3) Devices with access to the internet for research (Day 4) Research Websites (Day 4) All About Birds Cornell Lab of Ornithology https://www.allaboutbirds.org/ National Audubon Society https://www.audubon.org/ NestWatch (all about birdhouses) https://nestwatch.org/learn/all-about-birdhouses/ Sketch paper, pencils (Day 5) Wood, screws, nails, paint, carpenter's glue, asphalt roofing shingle, roofing nails, caulking compound, recycled materials, bottles, cans, cartons, containers, string, wire, scissors, hand saw, tape measure or ruler, drill, chisel or knife, hammer, screwdriver, Safety glasses (Day 5 - 7) Plans for birdhouses (Day 5-7) QR Code Generator (Day 8) https://www.qrstuff.com Printer (Day 8) Laminator (Day 8) Metal or wood posts (Day 8)		
INSTRUCTION	What will the teacher do?	What will the students do?	How much time for each activity?
Pre-assessment	Day 1 Present the following questions to the students 1) How do we identify different species of birds? 2) Name three different species of birds in our region. 3) List two reasons why a bird would not nest in a birdhouse. 4) Why is it important to	Day1 Students answer pre-assessment survey questions	40minutes 10minutes

	attract birds to our region? 5) Have you observed birds around your home? 6) What types of birds have you seen? Can you identify them? 7) What characteristics are common for most birds? What characteristics are different?		
Do-now/Hook	Day 1 (cont.) Teacher will tell a story: Have you ever quietly walked through the woods and listened to the many sounds in the upper canopy? Have you ever wondered what made the sounds you hear? And why they made that particular sound? Over the next several weeks we'll investigate the types of birds who reside in our backyard through observations and research. We learn about the optimal design for a birdhouse for each species. We design and build a birdhouse for each species we observe and design and build an observation station that includes a placard with a QR code that can be scanned to access information on the species of bird that is occupying the birdhouse.	Day 1 (cont.) Students engage in a discussion focused on bird watching and birdhouses.	30minutes
Procedure for Instruction/ Learning Activities	Day 2 Intro to the Sibley Bird App Pre-Class Prep: Download the Sibley Bird App onto an iOS (iPad, iPod, iPhone) or Android (Samsung Phone or Tablet, etc.) device	Day 2 Ask questions and engage in discussion	10 minutes

	(http://www.sibleyguides.com/about/the-sibley-eguide-to-birds-app/) Note: Once downloaded there is no need for an internet connection.Familiarize yourself with the App Today we familiarize ourselves with an application that aids us in the research of our local birds. The Sibley Bird App allows us to identify birds by sight and sound. The app provides detailed maps of summer and winter range. Additionally, it provides measurements of length, wingspan, and weight for each species. Let's get started! To begin, brainstorm with your partner a short (3-5) list of birds that can be found in our immediate area. We use this list to familiarize ourselves with the app. You complete the "Intro to the Sibley Bird App" handout as you navigate through the application. Day 3 Identify a local nature trail or park you can visit with the students. Review project and discuss key terms: Engineering Design Process, ornithology, species, habitat, observe, graph, traits, features, adaptation, simple machines (lever), lift, drag, gravity, camouflage Present the day's goal: Walk a	Introduce yourself to your partner. Brainstorm with your partner a short (3-5) list of birds that can be found in our immediate area. Use this list to familiarize yourself with the app. Complete the "Intro to the Sibley Bird App" handout as you navigate through the application. Day 3	30 minutes 40minutes 5 minutes

	nature trail, take note of bird species present and bird songs heard, complete the "Nature Trail Observation" handout.		
	Today we take a walk along the nature trail. We spend time sitting quietly, listening to our surroundings and observing the resident birds. It is very important that we are quiet for this activity. You complete the "Nature Trail Observation" handout with the use of your Sibley Bird App.	Walk along the nature trail. Spend time sitting quietly, listening to your surroundings and observing the resident birds. Complete the "Nature Trail Observation" handout with the use of your Sibley Bird App.	20-30 minutes
	Guide students through the trail. Encourage the students to sit in one spot and be still and quiet. Encourage the students to record the bird sounds and take pictures using the tablets/iPads for later research.	Student can record observations in a notebook or on the tablet/iPad. Students can record the bird sounds and take pictures using the tablets/iPads for later research.	
	Allow five minutes to remind students to reflect on today's observations and submit a journal entry via Google docs prior to next class. If time permits lead a group discussion on what observations the students noted.	Summarize the information you gathered today in a Google doc and submit to your teacher as a journal entry prior to next class.	5 minutes
	Day 4 Determine the top 5 birds observed and create a graph to BEST convey this information. Review project and discuss key terms: data analysis, pie charts, bar charts, statistics, tally chart, Inform students that today we	Day 4	40minutes 5 minutes

	begin research on the optimal design of a birdhouse for our top 5 most frequently observed birds. First we must compare our observation notes.		
	Do a "gallery walk" to determine which bird was the most frequently observed.	Students walk about the room reading each of the Nature Trail Observation cards displayed.	10 minutes
	Instruct partners on how to create a tally chart for each bird observed. Then instruct them on how to turn their tally chart in to a graph to determine the top 5 most frequently observed birds. Help the students create the charts in either a spreadsheet program or on paper.	Students create a tally chart for each bird observed by the class. Using the tally chart the student creates a graph that helps determine the top 5 most frequently observed birds. Students gather data.	15 minutes
		Students display their tally charts for a second "gallery walk." This time the students provide feedback on their classmates charts. The students write one thing they like and ask a question regarding something they see on the graph that could be improved or was not clear. For example, "I like how you chose different colors for each type of bird.", "I wonder if you would have provided a title on your chart if that would make it more clear?", "Did you think of….?", etc.	10minutes
	Day 5 Tell students: Yesterday we determined the top 5 birds that we observed on our nature walk. Today we will research the best design for a birdhouse for each type of bird.	Day 5	40minutes 5 minutes
	Instruct students to use the internet to conduct research on	Students conduct research on different kinds of birdhouse designs that are best for our top 5	35minutes

	different types of birdhouses. Provide them with websites for guided research and questions to focus their research. Help them with real size pictures of the birds observed available. Help students narrow down the different types of birdhouses based on the birds that were observed on the trail.	observed birds. Determine the best design for a birdhouse for each type of bird. Compile information about each birdhouse and the best fits for the birds observed. l	
	Day 6 Tell students "Today you and your partner first decide which one of the top 5 birds observed you would like to build a house for. And then brainstorm a design for your birdhouse, sketch the design including dimensions and materials, and then finally create a "shopping list" and budget for your project."	Day 6 Students first decides which one of the top 5 birds observed for which they would like to build a house. Students brainstorm a design for their birdhouse for this bird.	40minutes 10 minutes
	Help students use the information from their research and provide them with tough guidance on what they should build. Explain to them materials and tools they have access to. Check each groups final sketch and materials list prior to allow them to construct. Be sure each group stays on task and is making appropriate progress toward the end goal.	Then create a detailed sketch of the design including dimensions and materials, and then finally create a "shopping list" and budget for their project.	30 minutes
	Day 7,8 Organize necessary materials for the birdhouses. Materials: Wood, screws, nails, paint, carpenter's glue, asphalt roofing shingle, roofing nails,	Day 7,8	40minutes x 2 days

	caulking compound, etc. Tools: hand saw, tape measure or ruler, drill, chisel or knife, hammer, screwdriver, Safety glasses. Plans for birdhouses.		
	Discuss with class safety rules and features of each tool and material. Explain in detail how to appropriately use the tools and materials.	Listen to safety instructions from teacher. Practice using tools and materials in a safe manner. Ask for help when you are unsure or uncomfortable.	5-10 minutes each day
	Provide students with a starting point for the building of the birdhouse. Give students guidance on how to measure and cut materials. Guide students to attach materials successfully. Remind students 'Function before Decoration'	Use plans, guides and sketches to help create the best possible birdhouse. Students build birdhouses.	20-30 minutes each day
	Day 9 Instruct students to create a Google Doc with information that summarizes all the facts students have learned about the birds in the neighborhood. Teach students how to create a QR Code. Once students create and print their QR code, laminate them and attach them to a post. Place this post near where students hang their birdhouses.	Day 9 Students create a document (Google slides or doc) summarizing all the facts regarding the bird species of choice. Create a dynamic QR code. Print he QR code and have the teacher laminate it.	40minutes 5-10 minutes 20-30 minutes
	Day 10 Take students out onto nature trail again to determine the best location to hang their birdhouse and QR post. Help students install Birdhouses and QR posts nearby. Observe the success of the	Day 10 Students install birdhouses and QR posts in a place of their choosing along the nature trail. Observe birdhouse over the next few weeks and months to determine if birds moved into the birdhouse.	40minutes

	birdhouse. Did students make a successful birdhouse? Did birds move into it? Day 11 (Closure) Teacher assigns students to write a short 3-4 paragraph essay answering the following questions: What went well throughout the process, What did not go well throughout the process, What would you change about your birdhouse or QR code presentation, List three things you learned, List one thing you wish to learn more about. List one thing you would do differently next time.	Day 11 Students write a short 3-4 paragraph essay answering the following questions: What went well throughout the process, What did not go well throughout the process, What would you change about your birdhouse or QR code presentation, List three things you learned, List one thing you wish to learn more about. List one thing you would do differently next time.	40min
Differentiation	Students will be grouped by their abilities and interests. Teacher will provide scaffolded support where needed. Students who have physical disabilities will be accommodated for. Students who are meeting all of the expectations will be challenged to go above and beyond.		
Closure	Students write a short 3-4 paragraph essay answering the following questions: What went well throughout the process, What did not go well throughout the process, What would you change about your birdhouse or QR code presentation, List three things you learned, List one thing you wish to learn more about. List one thing you would do differently next time.		
ASSESSMENT			
College, Career, and Life Readiness Skills	See below Based on Middle-level Life/Career Rubrics available at https://nyctecenter.org/middle-level-life-career-rubric-database/rubrics		

Performance Measure	**Exemplary**	**Proficient**	**Developing**	**Beginning**
Makes Connections Between Work and Needs of Community	Easily and accurately describes how work products and services benefit the community.	Describes how work products and services benefit the community.	See some connection in how work products and services benefit the community.	Fail to understand how work products and services benefit the community.

Manages Time to Complete Tasks by Deadline	Completes work ahead of schedule by creating a plan to finish early.	Completes work on time by using time management skills.	Completes work on time with reminders and supervision.	Rarely completes work on time; fails to use time management skills.
Listens and Cooperates With Team Members	Consistently listens to others and their ideas; helps the team reach its full potential.	Listens to others points of view and makes a definite effort to understand their ideas.	Sometimes listens to others, but often assumes others ideas will not work. Tries to work well with the team.	Does not listen to group opinions and ideas; wants things done own way.
Listens and Speaks when Appropriate	Engages in conversations/ discussions and consistently understands when it is appropriate to speak and when it is appropriate to listen.	Engages in conversations/ discussions and understands when it is appropriate to speak and when it is appropriate to listen.	At times, speaks when it is not appropriate and does not listen when it is appropriate.	Often needs to be reminded of appropriate times to speak and appropriate times to listen.
Uses Technology to Locate and Evaluate Information	Effectively and consistently uses multiple technology tools to collect, organize, evaluate, and/or communicate information.	Uses technology effectively as a tool to collect, organize, evaluate, and/or communicate information.	Uses popular technology tools to collect and/or communicate information.	Attempts to use technology to collect and/or communicate information are ineffective.
Follows Procedures	Consistently and conscientiously follows all established procedures, avoids taking shortcuts or ignoring rules.	Follows all established procedures, avoids taking shortcuts or ignoring rules.	Usually follows established procedures.	Is unaware of and/or ignores procedures.
Practices Workplace Safety	Consistently selects and safely uses technological resources (e.g., equipment, machines, tools, electronics) to accomplish work efficiently and productively.	Selects and safely uses technological resources (e.g., equipment, machines, tools, electronics) to accomplish work productively.	Requires reminders to select and safely use technological resources (e.g., equipment, machines, tools, electronics) to accomplish work.	Often disregards safety standards and instructor and manufacturer guidelines.
Shows Empathy	Consistently puts aside personal viewpoint, always considers the other person's point of view.	Is able to put aside personal viewpoint, Regularly sees things from the other person's point of view.	Tries to see things from the other person's point of view.	Shows little interest in other people's needs or perspectives.

Maintains Focus to Completion of the Project	Stays focused consistently, prioritizes tasks, recognizes time constraints of projects, and avoids distractions while meeting deadlines.	Develops a timeline for the work to be completed and stays focused throughout the project.	Is occasionally off task in regards to accomplishing the project, thus only a portion of it is completed.	Is often off task and does not complete the project.
Resolves Problems that Arise in Completing Tasks	Easily and quickly identifies resources that may help solve a specific problem and applies critical thinking to using those resources effectively.	Identifies resources that may help solve a specific problem and applies critical thinking to using that resources correctly.	Sometimes identifies resources that may help solve a specific problem but does not apply critical thinking to using that resources.	Neither identifies resources that may help solve a specific problem nor applies critical thinking to aid in problem-solving.